VITAMIN B_1 AND THE GERMINATION OF POLLEN

BEGINNING with the work of Von Mohl[1] in 1838, varying degrees of success have attended attempts to cultivate pollen *in vitro*. The culture media in most cases consisted of a mixture of sugar and agar or sugar and gelatine. A very considerable improvement in these culture media was effected by Brink,[2] who discovered that a water extract of sterile yeast added in small amounts to the sugar media stimulated pollen tube germination.

In recent years it has been found[3] that the beneficial effects of yeast extracts on the growth of excised roots *in vitro* was due in part, at least, to the vitamin B_1 content of the yeast extract. This consideration has led the writers to suspect that vitamin B_1 might be the substance in yeast extract that produced the beneficial effects observed by Brink. That this vitamin does actually accelerate germination of pollen is shown in the following experiments.

Pollen from *Carica quercifolia* and from the Orlando, Fairchild and Florida varieties of *Carica papaya* was tested for germination percentage in Van Tiegham cells, using a medium of 4 per cent. sucrose and ¾ per cent. agar with and without the addition of crystalline vitamin B_1 (0.1–200 gamma per cc). With the exception of the Orlando variety, an addition of 100 gamma B_1 per cc resulted in a significant increase in the germination percentage over that obtained without B_1 (Table 1). This increase was, however, in most instances greater during the first two hours than after a four-hour period, which suggests that the main effect of the B_1 treatment was to speed up germination. A survey of the effectiveness of various concentrations of B_1 on the germination of pollen of the Florida variety showed that a maximum response was attained with 100 gamma per cc. Some acceleration in germination over controls was obtained from 50 gamma, but 0.1, 1 and 10 gamma gave no response. This effect from such high concentrations of B_1 is interesting in view of the fact that the optimum B_1 concentration for root growth has been found to be near 0.002 gamma per cc.[3]

TABLE 1

GERMINATION OF PAPAYA POLLEN WITH AND WITHOUT TREATMENT WITH VITAMIN B_1

Variety	Length of test period Hrs.	Control Per cent. germination	Vitamin B_1* Per cent. germination	Percentage difference over controls
C. quercifolia	1	10	21	+110.0
	1¾	25	37	+ 48.0
	2½	31	56	+ 80.6
	4½	71	80	+ 12.6
Fairchild	1	53	67	+ 26.4
	2½	67	77	+ 14.9
	4	75	88	+ 17.3
Florida	1	25	41	+ 64.0
	2	46	80	+ 73.9
	5	85	86	+ 1.1
Orlando	¾	35	32	+ 8.5
	1¾	76	75	− 1.3
	2½	80	77	− 3.7

* 100 gamma per cc.

Vitamin B_1 has been detected by biological assay in leaves, stems, roots, fruits and seed of many plants (Summary in Sherman and Smith.[4]) Also Dutcher[5] has demonstrated the presence of vitamin B in maize pollen. It may be that germination of pollen taking place without the addition of an external supply of B_1 is caused by naturally occurring vitamin B_1 in the pollen. Further work on the physiology of vitamin B_1 and other substances in pollen germination is under way. Addition of indoleacetic acid in concentration ranging from 1/10 to 100 gamma per cc had no beneficial effect on germination of papaya pollen.

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